PATENT

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Applicant	: Todd Allen Link, et al.	
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Docket (atty ref.) No.	: 15892-US	
Title	: SERIES HYDRAULIC CIRCUIT FOR CONTROLLING OPERATION OF MULTIPLE CUTTING DECKS OF A TRACTOR	

Moline, IL 61265

17 December 2007

Commissioner for Patents

P. O. Box 1450

Alexandria VA 22313-1450

APPEAL BRIEF

Sir:

Applicant hereby submits this Appeal Brief under 37 CFR 41.37.

Please charge the fee for the Appeal Brief and a one month extension fee against Deposit Account 04-525. Any fees or charges due as a result of filing of the present paper may be charged against Deposit Account 04-0525.

Respectfully,

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APPEAL BRIEF

(i) *REAL PARTY IN INTEREST.*

The real party in interest is the assignee of this application: Deere & Company having a principal place of business at One John Deere Place, Moline, Illinois 61265.

(ii) *RELATED APPEALS AND INTERFERENCES.*

There are no related appeals or interferences.

(iii) *STATUS OF CLAIMS.*

Claims 8, 9, 12 and 13 were rejected in a Final Office Action mailed July 18, 2007, and are now appealed.

(iv) *STATUS OF AMENDMENTS.*

An amendment was filed subsequent to final rejection, and entered by the Examiner in a September 28, 2007 Advisory Action.

(v) *SUMMARY OF CLAIMED SUBJECT MATTER.*

Claim 8 relates to a hydraulic system 10 connecting first, second and third hydraulic motors 12, 14, 16 in series, each motor rotating a separate mower blade under first, second and third mower decks. A first solenoid-operated directional control valve 24 and a second solenoid-operated directional control valve 55 are connected in parallel to an inlet line 20 from first hydraulic motor 12. A first pilot-operated directional control valve 32 and a second pilot-operated directional control valve 56 are connected in series to inlet line 20 from first hydraulic motor 12. Figs. 1-3 illustrate the hydraulic system of claim 1 which is described on page 3, paragraph 0014; page 4, paragraph 0017; and pages 4-5, paragraph 0019.

The first solenoid-operated directional control valve 24 is energized by lowering the second mower deck into an operating position to provide an electrical signal to first solenoid-operated directional control valve 24 which provides a first pilot signal to the first pilot-operated directional control valve 32 that in response to the first pilot signal directs a flow of hydraulic fluid passing through the first hydraulic motor 12 to pass through the second hydraulic motor 14 without directing the flow through any other restrictive valves. Fig. 2 shows the flow of hydraulic fluid through the first and second hydraulic motors 12, 14 while the first solenoid-operated directional control valve 24 is energized. The flow is described on page 3, paragraph 0016 through page 4, paragraph 0018.

The first solenoid-operated directional control valve 24 is deenergized by raising the second mower deck into a non-operating position to cut the electrical signal to the first solenoid-operated directional control valve 24 to end the pilot signal to the first pilot-operated directional control valve 32 to direct the flow of hydraulic fluid passing through the first hydraulic motor 12 to bypass the second hydraulic motor 14. Fig. 1 shows the flow of hydraulic fluid through the first hydraulic motor 12 once the first solenoid-operated directional control valve 24 is deenergized. This is described on page 6, paragraph 0023.

The second solenoid-operated directional control valve 55 is energized by lowering the third mower deck into an operating position to provide an electrical signal to the second solenoid-operated directional control valve 55 which provides a

second pilot signal to the second pilot-operated directional control valve 56 that in response to the second pilot signal directs a flow of hydraulic fluid passing through the first hydraulic motor 12 to pass through the third hydraulic motor 16 without directing the flow through any other restrictive valves. Fig. 3 shows the flow of hydraulic fluid through the first, second and third hydraulic motors 12, 14, 16 while the first and second solenoid-operated directional control valves are both energized. This also is described on page 4, paragraph 0019 through page 5, paragraph 0020.

The second solenoid-operated directional control valve 55 is deenergized by raising the third mower deck into a non-operating position to cut the electrical signal to the second solenoid-operated directional control valve 55 to end the pilot signal to the second pilot-operated directional control valve 56 to direct the flow of hydraulic fluid passing through the first hydraulic motor 12 to bypass the third hydraulic motor 16. Fig. 1 shows the flow of hydraulic fluid through the first hydraulic motor 12 once the first and second solenoid-operated directional control valves 24, 55 are deenergized. This is described on page 6, paragraph 0023.

Claim 9 relates to the hydraulic system of claim 8 wherein lowering both of the second and third mower decks into their operating positions causes the first and second solenoid-operated directional control valves 24, 55 to provide pilot signals to the first and second pilot-operated directional control valves 32, 56 that in response to the pilot signals direct the hydraulic fluid passing through the first hydraulic motor 12 to pass through the second and third hydraulic motors 14, 16 in series without directing the flow through any other restrictive valves. This is shown in Fig. 3 and described on page 5, paragraphs 0020-21.

Claim 12 relates to a hydraulic system 10 to provide hydraulic flow to first, second and third hydraulic motors 12, 14, 16 located on first, second and third mower decks, the second and third mower decks movable between operating and non-operating positions. Figs. 1-3 illustrate the hydraulic system, which also is described on page 3, paragraph 0014.

A pair of solenoid-operated control valves 24, 55 are connected to an input 20

from the first hydraulic motor 12, each solenoid-operated control valve 24, 55 associated with one of the second and third motors 14, 16 and providing a pilot signal if the mower deck on which the motor is located is moved to the operating position. Figs. 1-3 illustrate the solenoid-operated control valves, which are described on page 4, paragraph 0017; and pages 4-5, paragraph 0019.

A pair of pilot operated control valves 32, 56 are connected to the input from the first hydraulic motor 12 and operatively connected to the solenoid-operated control valves 24, 55. Each pilot operated control valve 32, 56 directs hydraulic flow passing through the first motor 12 to pass through one of the second and third motors 14, 16 in the presence of a pilot signal associated with that motor without directing the hydraulic flow through any other restrictive valves, and prevents hydraulic flow from passing through the second or third hydraulic motor 14, 16 in the absence of the pilot signal. Fig. 1 shows the pilot operated control valves 32, 56 preventing hydraulic flow from passing through the second and third hydraulic motors 14, 16. Fig. 2 shows the pilot operated control valves 32, 56 allowing hydraulic fluid to pass through motor 14. This also is described on pages 4-5, paragraphs 0018-20.

The pilot operated control valves 32, 56 direct hydraulic flow passing through the first motor 12 to pass through the second and third hydraulic motors 14, 16 in series in the presence of a pair of pilot signals without directing the hydraulic flow through any other restrictive valves. Fig. 3 shows the pilot operated control valves allowing hydraulic fluid to pass through motors 14 and 16. This is described on page 5, paragraph 21.

Claim 13 relates to the hydraulic system of claim 12 wherein the first hydraulic motor 12 is not associated with a solenoid-operated control valve. This is shown in Figs. 1-3.

(vi) *GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.*

Claims 8, 9, 12 and 13 were rejected under section 103 as being unpatentable over Applicant's admitted prior art in view of Cooper (US Patent 3,991,832) and Truax (US Patent 4,206,580). Applicant's admitted prior art discloses a hydraulic system for a lawn mower with motors 64, 66, 68 on each of three decks, a first solenoid-operated directional control valve 82 and a second solenoid-operated directional control valve connected in parallel to an inlet line from the first motor, providing first and second pilot signals to first and second pilot operated directional control valves connected in series to the inlet line. Applicant's admitted prior art allows flow to the second and third motors in the presence of a pilot pressure and prevents flow in the absence of the pilot signal.

However, Applicant's admitted prior art does not disclose that flow through the second or third motor is not directed through any other restrictive valve. Nor does Applicant's admitted prior art disclose that the respective pilot signal is provided when the deck is moved to a lowered operating position, and ended when the deck is moved to a raised non-operating position.

In the rejection, the Examiner asserted that Cooper teaches a hydraulic system with a pair of directional control valves 66, 68 that allow flow to a motor in the presence of an actuating signal (moved away from center position) and prevents flow in the absence of the signal (in center position), and that flow through the second or third motor is not directed through any other restrictive valve. The Examiner asserted it would have been obvious to replace the valve system of Applicant's admitted prior art with a valving system like Cooper's so that flow through the second or third motors is not directed through any other restrictive valve.

The Examiner also stated that Truax teaches a lawn mower hydraulic system having a side deck 9 associated with a motor 16 driving a mower blade, a directional control valve 102 allowing flow to the motor in the presence of a signal via 103, and preventing flow in the absence of the signal. The Examiner asserted it would have been obvious to provide the respective pilot signals to the motors of Applicant's admitted prior art, as modified by Truax. According to the Examiner, Truax's safety feature teaches allowing flow to the motor when the deck is moved to an operating

lowered position, and ending the pilot signal to prevent flow to the motor when the deck is moved to a non-operating raised position.

(vii) *ARGUMENT.*

A. The Section 103 rejections of claims 8, 9, 12 and 13 should be reversed.

1. Claim 8 is patentable over Applicant's admitted prior art in view of Cooper and Truax.

If the cited references were combined as suggested by Examiner, they would not address the problem or reveal the hydraulic circuit of claim 8. Claim 8 specifies a hydraulic circuit for turning three mower blades under decks, with two solenoid-operated directional control valves that provide pilot signals to pilot-operated directional control valves to direct hydraulic fluid passing through the first hydraulic motor to pass through second or third hydraulic motors without going through any other restrictive valves.

The combination of cited references does not show or suggest the claimed circuit.

The primary reference is Applicant's admitted prior art, which is a hydraulic circuit having a pair of solenoid valves 82 that may be energized to provide pilot signals to logic valves 80. However, the resulting circuit includes a check valve 86 that results in a pressure drop to reduce efficiency of the circuit. The present invention solves and eliminates that pressure drop problem.

In the final rejection, the Examiner asserted that Cooper teaches a valving system "wherein the flow through the second or third motor is not directed through any other restrictive valve."

However, even if Cooper lacks a restrictive valve, Cooper's circuit could not be combined with Applicant's admitted prior art because Cooper's circuit is fundamentally different.

First, Cooper's circuit does not let hydraulic fluid flow through any motor, as specified in claim 8 of the instant application. Instead, hydraulic pressure from the rod ends of each of Cooper's cylinders goes to the head end of the next cylinder. Specifically, hydraulic pressure at the rod ends of lift cylinders 22, 24 goes through valve 64 to the head end of angle cylinder 52, and hydraulic pressure from the rod end of Cooper's angle cylinder 52 goes through valve 66 to angling actuators 55 and

56. As a result, if Cooper's direction control valve 64 is open to operate lift cylinders 22, 24, Cooper's tilt cylinder 52 will have only limited functionality. Operation of Cooper's tilt cylinder is limited by the volume of hydraulic fluid displaced from the rod ends of the lift cylinders. Hydraulic fluid does not pass or flow through any of Cooper's cylinders, except for pressure relief through tilt cylinders 55, 56.

Second, Cooper's hydraulic circuit lacks any of the solenoid-operated directional control valves that provide pilot signals to pilot-operated directional control valves. Claim 8 specifies first and second solenoid-operated directional control valves in parallel. Cooper only shows three direction control valves 64, 66, 68 in series. Cooper is unrelated to a hydraulic circuit for rotating mower blades. Instead, Cooper relates to a circuit that operates lift cylinders that lift, tilt or angle a dozer blade.

The other reference cited by the Examiner is the Truax patent. The Examiner asserted that Truax shows a hydraulic system for a lawn mower where flow to the motor is allowed when the deck is lowered, and prevented when the deck is raised. While that assertion may be true, Truax fails to teach anything about a circuit that passes hydraulic fluid through from one hydraulic motor to the next. Nor is Truax's actuator 103 part of a hydraulic circuit with any solenoid-operated control valve. Instead, Truax's actuator 103 rides on cam surfaces 32A, 32B to close second valve 102.

For these reasons, claim 8 is patentable over the combination of Applicant's admitted prior art, Cooper and Truax.

2. Claim 9 is patentable over Applicant's admitted prior art in view of Cooper and Truax.

Claim 9 specifies the hydraulic system of claim 8 where both of the second and third mower decks may be lowered to their operating positions if both solenoid-operated directional control valves provide pilot signals to the pilot-operated directional control valves. As a result, hydraulic fluid passing through the first hydraulic motor passes through both of the second and third motors in series, without going through any other restrictive valves.

Claim 9 is patentable over the same three references for the same reasons as claim 8 on which it depends.

Applicant's admitted prior art circuit is exemplary of problems faced in the prior art, and overcome by the instant invention. The admitted prior art circuit allows hydraulic fluid to pass through three motors in series, but there is a restrictive valve 86 that reduced pressure.

Cooper's circuit directs hydraulic pressure from the rod ends of one cylinder to the head end of the next cylinder. The operation of each cylinder is limited by the volume of hydraulic fluid displaced from the rod end of the preceding cylinder. Hydraulic fluid does not pass or flow through any of Cooper's cylinders except for pressure relief through tilt cylinders 55, 56.

Truax is a machine with only a single motor. Truax lacks any teaching of three hydraulic motors, or a circuit where hydraulic fluid passes through one hydraulic motor to the next.

3. Claim 12 is patentable over Applicant's admitted prior art in view of Cooper and Truax.

Claim 12 specifies a hydraulic system with three hydraulic motors on mower decks, a pair of solenoid-operated control valves providing pilot signals if their associated mower decks are lowered to operating positions, and a pair of pilot-operated control valves directing hydraulic flow passing through the first motor to pass through the second and/or third hydraulic motors in series in the presence of the pilot signal or signals, without going through any other restrictive valves.

The Examiner's proposed combination of references fails to show or suggest the claimed system.

Applicant's admitted prior art shows a hydraulic system having a pair of solenoid valves 82 that may be energized to provide pilot signals to logic valves 80. The admitted prior art circuit also requires check valve 86 that results in a pressure drop to reduce efficiency of the circuit. The present invention solves that pressure drop problem.

The Examiner conceded that Applicant's admitted prior art fails to address the pressure drop problem, but asserted that Cooper teaches a valving system "wherein the flow through the second or third motor is not directed through any other restrictive valve." The Examiner's assertion is incorrect for the following reasons.

First, Cooper's circuit does not permit hydraulic fluid to flow through any motor, which is specified in claim 8 of the instant application. Instead, hydraulic pressure from the rod ends of each of Cooper's cylinders goes to the head end of the next cylinder. Specifically, hydraulic pressure at the rod ends of lift cylinders 22, 24 goes through valve 64 to the head end of angle cylinder 52, and hydraulic pressure from the rod end of Cooper's angle cylinder 52 goes through valve 66 to angling actuators 55 and 56. If Cooper's direction control valve 64 is open to operate lift cylinders 22, 24, Cooper's tilt cylinder 52 has only limited functionality, due to the limited volume of hydraulic fluid displaced from the rod ends of the lift cylinders. Hydraulic fluid does not pass or flow through any of Cooper's cylinders, except for pressure relief through tilt cylinders 55, 56.

Second, Cooper's hydraulic circuit lacks solenoid-operated directional control valves that provide pilot signals to pilot-operated directional control valves. Cooper only shows three direction control valves 64, 66, 68 in series, without any pilot signals. Cooper is unrelated to a hydraulic circuit for rotating mower blades. Instead, Cooper relates to a circuit that operates lift cylinders that lift, tilt or angle a dozer blade.

The Examiner also combined Applicant's admitted prior art and Cooper with the Truax patent, asserting that Truax shows a hydraulic system for a lawn mower where flow to the motor is allowed when the deck is lowered, and flow is prevented when the deck is raised. However, Truax teaches nothing about a circuit that passes hydraulic fluid through from one hydraulic motor to the next. Nor is Truax's actuator 103 part of a hydraulic circuit with any solenoid-operated control valve. Instead, Truax's actuator 103 rides on cam surfaces 32A, 32B to close second valve 102.

4. Claim 13 is patentable over Applicant's admitted prior art in view of Cooper and Truax.

Claim 13 is patentable over the cited combination of references for at least the same reasons as claim 12 on which it depends.

5. Conclusion

For the foregoing reasons, the Examiner's final rejection of claims 8, 9, 12 and 13 should be reversed.

(viii) *CLAIMS APPENDIX.*

1 - 7. (Cancelled)

8. A hydraulic system connecting first, second and third hydraulic motors in series, each motor rotating a separate mower blade under first, second and third mower decks, comprising:

a first solenoid-operated directional control valve and a second solenoid-operated directional control valve, which are connected in parallel to an inlet line from the first hydraulic motor,

a first pilot-operated directional control valve and a second pilot-operated directional control valve, which are connected in series to the inlet line from the first hydraulic motor;

the first solenoid-operated directional control valve energized by lowering the second mower deck into an operating position to provide an electrical signal to the first solenoid-operated directional control valve which provides a first pilot signal to the first pilot-operated directional control valve that in response to the first pilot signal directs a flow of hydraulic fluid passing through the first hydraulic motor to pass through the second hydraulic motor without directing the flow through any other restrictive valves; the first solenoid-operated directional control valve being de-energized by raising the second mower deck into a non-operating position to cut the electrical signal to the first solenoid-operated directional control valve to end the pilot signal to the first pilot-operated directional control valve to direct the flow of hydraulic fluid passing through the first hydraulic motor to bypass the second hydraulic motor; and

the second solenoid-operated directional control valve energized by lowering the third mower deck into an operating position to provide an electrical signal to the second solenoid-operated directional control valve which provides a second pilot signal to the second pilot-operated directional control valve that in response to the second pilot signal directs a flow of hydraulic fluid passing through the first hydraulic motor to pass through the third hydraulic motor without directing the flow through any

other restrictive valves; the second solenoid-operated directional control valve being de-energized by raising the third mower deck into a non-operating position to cut the electrical signal to the second solenoid-operated directional control valve to end the pilot signal to the second pilot-operated directional control valve to direct the flow of hydraulic fluid passing through the first hydraulic motor to bypass the third hydraulic motor.

9. The hydraulic system of claim 8 wherein lowering both of the second and third mower decks into their operating positions causes the first and second solenoid-operated directional control valves to provide pilot signals to the first and second pilot-operated directional control valves that in response to the pilot signals direct the hydraulic fluid passing through the first hydraulic motor to pass through the second and third hydraulic motors in series without directing the flow through any other restrictive valves.

10-11. (Cancelled)

12. A hydraulic system to provide hydraulic flow to first, second and third hydraulic motors located on first, second and third mower decks, the second and third mower decks movable between operating and non-operating positions, comprising:

a pair of solenoid-operated control valves connected to an input from the first hydraulic motor, each solenoid-operated control valve associated with one of the second and third motors and providing a pilot signal if the mower deck on which the motor is located is moved to the operating position; and

a pair of pilot operated control valves connected to the input from the first hydraulic motor and operatively connected to the solenoid-operated control valves; each pilot operated control valve directing hydraulic flow passing through the first motor to pass through one of the second and third hydraulic motors in the presence of a pilot signal associated with that motor without directing the hydraulic flow through any other restrictive valves, and preventing hydraulic flow from passing through the second or third hydraulic motor in the absence of the pilot signal; the

pilot operated control valves directing hydraulic flow passing through the first motor to pass through the second and third hydraulic motors in series in the presence of a pair of pilot signals without directing the hydraulic flow through any other restrictive valves.

13. The hydraulic system of claim 12 wherein the first hydraulic motor is not associated with a solenoid-operated control valve.

(ix) *EVIDENCE APPENDIX.*

No materials.

(x) RELATED PROCEEDINGS APPENDIX.

No materials.